Attorney's Docket No.: 06618/776001/CIT3395

Amendments to the Specification:

Please replace paragraph [0018] with the following amended paragraph:

Figure 1 shows a basic diagram of the operation and Figure 4 shows a flowchart of the basic operation. In general, the operation can be carried out on any programmed computer. [[G]]Figure 1 may be embodied in a general-purpose computer, as software within the computer, or as any kind of hardware system including dedicated logic, programmable logic, and the like. The images may be obtained from files, or may be obtained using a camera.

Please replace paragraph [0023] with the following amended paragraph:

Model training at 410 trains the feature detectors using the resultant clusters, in the model learning block 120. This is done to estimate which [[are]] of the features are actually the most informative, and to determine the probabilistic description of the constellation that these features form when they are exposed to an object of interest. This is done by forming the model structure, establishing a correspondence between homologous parts across the training set, and labeling and other parts as background or noise.

Please replace paragraph [0029] with the following amended paragraph:

The entire set X of feature candidates can be divided between candidates which are [[be]] true features of the object or the "foreground", and noise features also called the "background". The random variable vector **h** may be used to create a set of indices so that if $\mathbf{h}_i = j;, j>0$, if the point x_{ij} is a foreground point. If an object part is not included in X^0 then the corresponding entry in **h** will be zero.

Please replace paragraph [0041] with the following amended paragraph:

At [[130]]230, update rules are determined. This may be done by decomposing Q into four parts:

$$\begin{aligned} Q(\tilde{\theta}|\theta) &= Q_1(\tilde{\theta}|\theta) + Q_2(\tilde{\theta}|\theta) + Q_3(\tilde{\theta}|\theta) + Q_4(\theta) \\ &= \sum_{\tau=1}^{T} E[\log p(\mathbf{n}_\tau|\theta)] + \sum_{\tau=1}^{T} E[\log p(\mathbf{b}_\tau|\theta)] \\ &+ \sum_{\tau=1}^{T} E[\log p(X_\tau^o, \mathbf{x}_\tau^m|\mathbf{h}_\tau, \mathbf{n}_\tau, \theta)] \\ &+ \sum_{\tau=1}^{T} E[\log p(\mathbf{h}_\tau|\mathbf{n}_\tau, \mathbf{b}_\tau)] \end{aligned}$$

The first three terms contain the parameters that will be updated while the last term includes no new parameters. First, the update rules for μ. Q3 depends only on μ tilde. Therefore,

taking the derivative of the expected likelihood yields

$$\frac{\partial}{\partial \bar{\mu}} Q_3(\tilde{\theta}|\theta) = \sum_{\tau=1}^{T} E\left[\bar{\Sigma}^{-1}(z_\tau - \bar{\mu})\right],$$

Where $z^T = (x^o\, x^m)$ according to the definition above. Setting the derivative to 0 yields the update rule

$$\bar{\mu} = \frac{1}{T}\sum_{\tau=1}^{T} E[z_\tau].$$

Please replace paragraph [0045] with the following amended paragraph:

At [[140]]240 the sufficient statistics are determined. The posterior density is given by

$$p(\mathbf{h}_\tau, \mathbf{x}_\tau^m, \mathbf{n}_\tau, \mathbf{b}_\tau | X_\tau^o, \theta) = \frac{p(\mathbf{h}_\tau, \mathbf{x}_\tau^m, \mathbf{n}_\tau, \mathbf{b}_\tau, X_\tau^o|\theta)}{\sum_{\mathbf{h}_\tau \in \mathcal{H}_\mathbf{h}} \sum_{\mathbf{b}_\tau \in \mathcal{B}} \sum_{\mathbf{n}_\tau=0}^{\infty} \int p(\mathbf{h}_\tau, \mathbf{x}_\tau^m, \mathbf{n}_\tau, \mathbf{b}_\tau, X_\tau^o|\theta)\, d\mathbf{x}_\tau^m}$$

Which may be simplified by noticing that if the summations are carried out in the order

$$\sum_{\mathbf{h}_\tau \in \mathcal{H}_\mathbf{h}} \sum_{\mathbf{b}_\tau \in \mathcal{B}} \sum_{\mathbf{n}_\tau=0}^{\infty}$$

Then certain simplifications may be made.

Please replace paragraph [0053] with the following amended paragraph:

This system may be used for a number of different applications. In a first application, the images may be indexed into image databases. Images may be classified automatically enabling a user to search images that include given objects. For example, a user could show this system [[c]]an image that includes a frog, and obtain back from [[at]]it all images that included frogs.

Please replace paragraph [0054] with the following amended paragraph:

Autonomous agents/vehicle/robots could be used. For example, this system could allow a robot to [[Rome]]roam an[[d]] area and learn all the objects were certain objects are pres[[id]]ent. The vehicle could then report events that differ from the normal background or find certain things.